

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. - 3. (Canceled)

4. (Currently Amended) A semiconductor integrated circuit chip, formed as a plate-like semiconductor chip having a first principal surface side and an oppositely facing second principal surface side, comprising:

a circuit forming layer, on which a plurality of circuits are formed, being formed at a first main surface of an integrated circuit (IC) board, said first main surface corresponding to the first principal surface side of the plate-like semiconductor chip;

driving means of an operating fluid being formed at a second main surface of said IC board, opposite that of said first main surface; and

a heat transfer layer being made of a material similar to that of said IC board and connected with the IC board in one body, said heat transfer layer having an outer surface and an opposing inner surface, the outer surface thereof corresponding to the second principal surface side of the plate-like semiconductor chip and in which there is formed between said inner surface and said second main surface of the IC board a closed flow passage, an operating fluid being hermetically enclosed within the closed flow passage,

wherein said driving means of the operating fluid is made of a resistor layer

and is outside the closed flow passage of said operating fluid, the resistor layer being electrically operated to give vibration to the hermetically enclosed operating fluid. A semiconductor integrated circuit chip, formed as a plate-like semiconductor chip, comprising:

a circuit forming layer, on which a plurality of circuits are formed, being formed on one surface side of the plate-like semiconductor chip; and

a heat transfer layer, connected with the plate-like semiconductor chip in one body, being formed on another, opposing surface side of the plate-like semiconductor chip, and which forms between said another, opposing surface side of the plate-like semiconductor chip and one surface side of said heat transfer layer opposing thereto:

a closed flow passage;

an operating fluid hermetically enclosed within said closed flow passage; and driving means of said operating fluid,

wherein said driving means of the operating fluid is made of electrically operated means for giving vibration to the hermetically enclosed operating fluid,

wherein said heat transfer layer is made of a material similar to that of said semiconductor chip, and

wherein the vibration giving means includes a resistor layer, positioned outside the closed flow passage of said operating fluid, which enables formation of bubbles in the operating fluid.

5. (Previously Presented) The semiconductor integrated circuit chip according to claim 4, wherein said resistor layer is disposed in a region where heat generation density is lower than an average of heat generation density of said integrated circuit chip as a whole.

6. (Previously Presented) The semiconductor integrated circuit chip according to claim 4, wherein said operating fluid is water.

7. (Currently Amended) The semiconductor integrated circuit chip claim 4, wherein said plate-like semiconductor chip includes logic elements and memory elements which are formed separately within said one-first principal surface side thereof.

8. (Currently Amended) The semiconductor integrated circuit chip according to claim 4, wherein the closed flow passage in said heat transfer layer is configured as a plurality of closed flow passages ~~at said another surface side of said semiconductor chip formed between said inner surface of the heat transfer layer and said second main surface of the IC board.~~

9. (Previously Presented) The semiconductor integrated circuit chip according to claim 8, wherein each of said plurality of closed flow passages has a separate said means for driving the operating fluid enclosed within an inside thereof.

10. (Previously Presented) The semiconductor integrated circuit chip according to claim 9, further comprising a plurality of temperature detecting means which are provided within said semiconductor chip, wherein the plural driving means, which are provided for the plural closed flow passages, respectively, are controlled in dependence on temperature detection outputs from said temperature detecting means.

11. (Currently Amended) The semiconductor integrated circuit chip according to claim 8, further comprising another closed flow passage, which is formed at a same surface side of said semiconductor chip as said plurality of closed flow passages and between said inner surface of the heat transfer layer and said second main surface of the IC board crossing over said plurality of closed flow passages.

12. (Previously Presented) The semiconductor integrated circuit chip according to claim 11, wherein each of said plurality of closed flow passages has a separate said means for driving the operating fluid enclosed within an inside thereof.

13. (Previously Presented) The semiconductor integrated circuit chip according to claim 12, further comprising a plurality of temperature detecting means which are provided within said semiconductor chip, wherein the plural driving means, which are provided for the plural closed flow passages, respectively, are

controlled in dependence on temperature detection outputs from said temperature detecting means.

14. (Currently Amended) A semiconductor integrated circuit chip, formed as a plate-like semiconductor chip having a first principal surface side and an oppositely facing second principal side, comprising:

an integrated circuit (IC) board having a plurality of circuits formed at a first main surface thereof, corresponding to the first principal surface side of the plate-like semiconductor chip;

driving means of an operating fluid being formed at a second main surface of said IC board, opposite that of said first main surface thereof; and

a heat transfer layer being made of a material similar to that of said IC board and integrated with the IC board in one body, for suppressing a local increase of temperature caused by heat generation of circuits within said IC board, said heat transfer layer having an outer surface and an opposing inner surface, the outer surface thereof corresponding to the second principal surface side of the plate-like semiconductor chip and in which there is formed between said inner surface and said second main surface of the IC board a closed flow passage,

wherein said driving means of the operating fluid is made of a resistor layer, the resistor layer being electrically operated to give vibration to the hermetically enclosed operating fluid. A semiconductor integrated circuit chip, comprising:

a plate-like semiconductor chip;

a circuit forming layer, on which a plurality of circuits are formed, being formed on one surface side of said plate-like semiconductor chip; and

~~a heat transfer layer, being formed on another surface side of the plate-like semiconductor chip, opposite to the surface side on which said circuit forming layer is formed and connected therewith in one body, for suppressing a local increase of temperature caused by heat generation of circuits within said circuit forming layer of said semiconductor chip, said heat transfer layer forming between said another, opposing surface side of the plate-like semiconductor chip and one surface side of said heat transfer layer opposing thereto:~~

~~a closed flow passage;~~

~~an operating fluid hermetically enclosed within said closed flow passage; and driving means of said operating fluid,~~

~~wherein said driving means of the operating fluid is made of electrically operated means for giving vibration to the hermetically enclosed operating fluid,~~

~~wherein said heat transfer layer is made of a material similar to that of said semiconductor chip, and~~

~~wherein the vibration giving means includes a resistor layer, positioned outside the closed flow passage of said operating fluid, which enables formation of bubbles in the operating fluid.~~

15-20. (Canceled)

21. (Previously Presented) The semiconductor integrated circuit chip according to claim 4, wherein both said plate-like semiconductor chip and said heat transfer layer are made of a material of silicon.

22. (Currently Amended) A semiconductor integrated circuit chip, formed as a plate-like semiconductor chip having a first principal surface side and an oppositely facing second principal surface side, comprising:

a circuit forming layer, on which a plurality of circuits are formed, being formed at a first main surface of an integrated circuit (IC) board, said first main surface corresponding to the first principal surface side of the plate-like semiconductor chip;

driving means of an operating fluid being formed at a second main surface of said IC board, opposite that of said first main surface; and

a heat transfer layer being made of a material similar to that of said IC board and connected with the IC board in one body, said heat transfer layer having an outer surface and an opposing inner surface, the outer surface thereof corresponding to the second principal surface side of the plate-like semiconductor chip and in which there is formed between said inner surface and said second main surface of the IC board a closed flow passage, an operating fluid being hermetically enclosed within the closed flow passage. A semiconductor integrated circuit chip, formed as a plate-like semiconductor chip, comprising:

a circuit forming layer, on which a plurality of circuits are formed, being formed on one surface side of the plate-like semiconductor chip; and

a heat transfer layer, connected with the plate-like semiconductor chip in one body, being formed on another, opposing surface side of the plate-like semiconductor chip, and which forms between said another, opposing surface side of the plate-like semiconductor chip and one surface side of said heat transfer layer opposing thereto:

~~a closed flow passage;~~
~~an operating fluid hermetically enclosed within said closed flow passage; and~~
~~driving means of the hermetically enclosed operating fluid;~~
~~wherein said heat transfer layer is made of a material similar to that of said~~
~~semiconductor chip.~~

23. (Currently Amended) A semiconductor integrated circuit chip, formed in
one chip as a plate-like semiconductor chip having a first principal surface side and
an oppositely facing second principal surface side, comprising:

an integrated circuit (IC) board having a plurality of circuits formed at a first
main surface thereof, corresponding to the first principal surface side of the plate-
like semiconductor chip;

driving means of an operating fluid being formed at a second main surface of
said IC board, opposite that of said first main surface thereof; and

a heat transfer layer being made of a material similar to that of said IC board
and integrated with the IC board in one body, for suppressing a local increase of
temperature caused by heat generation of circuits within said IC board, said heat
transfer layer having an outer surface and an opposing inner surface, the outer
surface thereof corresponding to the second principal surface side of the plate-like
semiconductor chip and in which there is formed between said inner surface and
said second main surface of the IC board a closed flow passage. A semiconductor
integrated circuit chip, comprising:

~~a plate-like semiconductor chip;~~

~~a circuit forming layer, on which a plurality of circuits are formed, being~~

formed on one surface side of said plate-like semiconductor chip; and
a heat transfer layer, being formed on another surface side of the plate-like semiconductor chip, opposite to the surface side on which said circuit forming layer is formed and connected therewith in one body, for suppressing a local increase of temperature caused by heat generation of circuits within said circuit forming layer of said semiconductor chip, said heat transfer layer forming between said another, opposing surface side of the plate-like semiconductor chip and one surface side of said heat transfer layer opposing thereto:
a closed flow passage;
an operating fluid hermetically enclosed within said closed flow passage; and
driving means of the hermetically enclosed operating fluid,
wherein said heat transfer layer is made of a material similar to that of said semiconductor chip.

24. (Currently Amended) The semiconductor integrated circuit chip according to claim 23, wherein both said plate-like semiconductor chip IC board and said heat transfer layer are made of a material of silicon.